Dear Readers,

We are pleased to bring to you our trilogy edition on Construction & Demolition (C&D) waste. This edition includes research and practice papers providing a ringside view of developments on this theme across geographies and the possibilities it holds. This edition has been guest edited by Dr. Sivakumar Kandasami.

Dr. Sivakumar Kandasami is a trained concrete technologist with the Construction Division of Larsen & Toubro. His Ph.D. work at the University of Dundee, UK was on concrete durability and his expertise is frequently sought for mega projects designed to last an intended service life. He takes keen interest in developing robust solutions for concreting challenges at site, involves in R&D efforts within Larsen & Toubro and regularly reviews manuscripts for scholarly journals.

The Institution of Civil Engineers (ICE), UK awarded him the MCR PRIZE 2012 for the best paper published in the Magazine of Concrete Research. He is an Editorial Board member of Construction Materials (ICE, UK) and Journal of Testing and Evaluation (ASTM, USA). He is a Fellow of the Institute of Concrete Technology (UK) and the Institution of Engineers (India).

Production Editor
Indian Concrete Journal

Dear Colleagues,

Greetings to all readers and believe you are staying safe and healthy amidst this COVID-19 pandemic. Welcome to another special edition on Construction & Demolition (C&D) waste, comprising invited papers from authors based in India, UK, Norway, Finland, Germany, and China. Such a diverse spread of contributions shows the constant reinvention happening continually across the world and the consequent opening of new vistas for application of C&D waste. I sincerely thank all the authors for audaciously seeing possibilities in an edgy terrain and hopefully this issue will help in better sensemaking on the portent of things to come. I am therefore excited to introduce the contents of this issue which can hopefully drive genuine conversation between stakeholders.

The point of view by Goodier and Dodds (2020) gives a global perspective on the use of recycled concrete aggregate (RCA) towards better sustainability whilst pointing out the existing limitations on its use, in part imposed by prevailing international design standards which are not fit for purpose. Development of consensus-based standards lag while the technology moves forward at a rapid pace. The promising viability of using RCA in sustainable infrastructure projects requires best practice guidelines and a complimentary support derived from timely revision of existing standards and specifications. This is especially required in instances, where there is a need to separate good quality structural concrete from low quality demolition arisings. Moreover, demolition practices and processing techniques vary across geographies and transporting long distance is expensive and detrimental to the cause of sustainability, unless we see electrical trucks on roads. Interestingly this opinion piece gives a snapshot of an extensive laboratory research programme involving 1400 concrete specimens made of RCA sourced from more than 40 years plus demolition arisings. Such a comprehensive study brings out the stark contrast between research and reality; the need for further research remains and a desired change in approach towards structural design is apparently becoming even more important.

The leader paper of this issue, written by Kshemendra Nath and Bhatiani (2020), grapples with the ever-increasing generation of C&D waste from urbanisation and industrialisation of cities in India. Getting proper statistical data and diligently compiling them in a readable format is a huge ask, and the effort of the authors in superbly collating them deserves commendation. For example, a systematic assessment of C&D waste generation in Goa is given in detail. Such a carefully compiled dataset is useful for policy planners to make an informed judgement. Various business models and policy enablers make for interesting reading. This paper adds to relentless efforts in various media to wean away bloated bureaucracies from rigidly held stances impeding use of RCA.

Like India, in neighbouring China the construction industry is highly active leading to scarcity of natural mineral sources. Their Government policy which prohibits mining of natural resources and indiscriminate burying in landfill of C&D waste generated from earthquakes, is a major driver to find new pathways. This has prompted widespread use of RCA and the paper by Zhao et. al. (2020) details a bold approach of its use in a structural engineering application. By use of extensive instrumentation in a real structure i.e. installation of strain gauges in few slabs, beams, columns made of RCA, the authors have provided authoritative findings on real-time use of RCA. Notably, capping of the RCA replacement at 50%, is suggested for satisfactory performance of concretes. An extension of this work

detailing performance in seismic conditions would be a useful contribution for a future issue of this journal.

With variable properties, the performance of RCA as a product depends very much on the source of C&D waste and the processing effort involved. Having said that, it is quite difficult to capture the variation in properties by existing codes of practice, which have a lot of catch up to do. Given this harsh reality, the authors Engelsen et. al. (2020) have carried out an extensive assessment of the product coming from a large C&D waste processing facility in Delhi. This meticulous work involved daily sampling of a low-grade mixed C&D waste over a 5-month period, in a unique location and detailed information on such a source is rare to come across. The findings of this study are encouraging, as it recommends use of recycled C&D waste from this processing facility to manufacture recycled products – great for circular economy.

Moving on, the paper by Girish et. al. (2020) argues for adopting self-compacting concrete (SCC) as an effective tool when RCA is to be used without processing either due to lack of processing facility or if such a facility is not in proximity. The authors suggest SCC for unprocessed RCA, as the high powder content could possibly overcome deficiencies in the aggregate characteristics. Chen et. al. (2020) detail an application of RCA in pervious concrete, proving its versatility for use in sustainable drainage systems. The paper by Guo et. al. (2020) demonstrates intelligent application of nanotechnology via graphene oxide to improve the interfacial transition zone properties of concrete made with RCA. The following paper by Perumal et. al. (2020) introduces an interesting project "DeConcrete" specific to the Arctic region countries, that aims to promote greater co-operation between the various stakeholders and thereby, promote circular economy. Hunt and Moriarty (2020) explain the sustainability aspects in mining and use of magnetite in various applications, including an interesting example of recycling magnetite from a dismantled offshore platform.

The closing article by Bittner (2020) shows the way forward with the upcoming 3D printing (3DP) technology in construction. It argues that an increasing gap in product offering is the prime mover for adopting 3DP of concrete structures, as the principles of standardisation, industrialisation, automation, and digitalisation, creep into the construction industry from other engineering disciplines. The author makes a business case for 3DP, but nevertheless, reminds the readers that the triage of time, cost and quality could dictate its evolution for the foreseeable future. While the lack of coarse aggregates in 3DP pushes up the quantity of cement mortar required and the associated cost, there is also scope for use of finer fraction of RCA and research is in progress at leading institutes across the world. It must be realised that the vast requirement of conventional concrete usage cannot be pushed away, as 3DP has been used judiciously to print lost formwork and conventional concrete is poured to fill the void. Development of acceptance criteria for 3DP in construction, although not at a rapid pace, is a welcome move indeed – useful information for readers.

We thank all the contributors and the reviewers for their valuable support in enhancing the quality of the publication.

Recommend reading all the papers, as I believe the content is useful for further research and relevant for practice as well.

Happy reading!

Sivakumar Kandasami
Guest Editor for the Special Issue, ICJ

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